JC07 Rec'd PCT/PTO 15 NOV 2001

FORM PTO-1390 (REV. 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

# TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY 'S DOCKET NUMBER: DN1999131 (.065.0131)

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 09/980835

| INTERNATIONAL APPLICATION NO. | INTERNATIONAL FILING DATE | PRIORITY DATE CLAIMED |
|---|---|---|
| PCT/US99/15940 | | |

TITLE OF INVENTION: BEAD CURING FINGER MOLD

APPLICANT(S) FOR DO/EO/US: William Allen Rex, Kenneth Dean Conger, Brian Joseph Wilson

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☐ has been communicated by the International Bureau.
   c. ☒ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11 to 20 below concern document(s) or information included:**

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☐ Other items or information:

| U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/980835 | INTERNATIONAL APPLICATION NO. | ATTORNEY'S DOCKET NUMBER |
|---|---|---|

| 21. ☐ The following fees are submitted: | CALCULATIONS PTO USE ONLY | |
|---|---|---|
| **BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):** | | |
| Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... **$1000.00** | | |
| International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... **$860.00** | | |
| International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... **$710.00** | | |
| International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... **$690.00** | | |
| International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... **$100.00** | | |
| **ENTER APPROPRIATE BASIC FEE AMOUNT =** | $ 860 | 00 |
| Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | $ 000 | 00 |

| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | | |
|---|---|---|---|---|---|
| Total claims | - 20 = | | x **$18.00** | $ 000 | 00 |
| Independent claims | - 3 = | | x **$80.00** | $ 000 | 00 |
| MULTIPLE DEPENDENT CLAIM(S) (if applicable) | | | + **$270.00** | $ 000 | 00 |
| **TOTAL OF ABOVE CALCULATIONS =** | | | | $ 860 | 00 |
| ☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. | | | + | $ | |
| **SUBTOTAL =** | | | | $ 860 | 00 |
| Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). | | | | $ 000 | 00 |
| **TOTAL NATIONAL FEE =** | | | | $ 860 | 00 |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property + | | | | $ 000 | 00 |
| **TOTAL FEES ENCLOSED =** | | | | $ 860 | 00 |
| | | | | **Amount to be refunded:** | $ |
| | | | | **charged:** | $ |

a. ☐ A check in the amount of $ _____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. 07-1725 in the amount of $ 860.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-1725 A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

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Patent Dept. D/823
1144 East Market Street
Akron, Ohio 44316

Frederick K. Lacher
SIGNATURE

Frederick K. Lacher
NAME

16,502
REGISTRATION NUMBER

20 DEC 2001

09/980835

#2

| FORM PTO-1390 (REV. 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | | ATTORNEY'S DOCKET NUMBER |
|---|---|---|
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | DN1999131 (1065.0131) |
| | | U.S. APPLICATION NO. (If known, see 37 CFR 1.5 |
| INTERNATIONAL APPLICATION NO. PCT/US99/15940 | INTERNATIONAL FILING DATE July 13, 1999 (13.07.99) | PRIORITY DATE CLAIMED |
| TITLE OF INVENTION BEAD CURING FINGER MOLD | | |
| APPLICANT(S) FOR DO/EO/US William Allen Rex, Kenneth Dean Conger, Brian Joseph Wilson | | |

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20. ☐ Other items or information:

# BEAD CURING FINGER MOLD

## Technical Field

This invention related to molding a tire bead and especially to curing the rubber coating on the bead wires of a bead bundle which is held in a predetermined shape. The bead wires are held in place during the vulcanization so that when the bead ring is placed in a mold for injection molding of an apex on the bead, the mold will not be damaged by out of place wires. The bead bundle is also cured in a circular shape so that problems with pinching out of round beads are avoided during the closing of the bead apex mold.

## Background Art

Heretofore as shown and described in U.S. Patent No. 5,798,127, a bead bundle of rubber coated bead wires has been placed in an apex mold and held in position by blades engaging the radially inner surface of the tire bead bundle. The apex-bead assembly is then formed by injection of rubber into the apex mold cavity of the apex mold. If the bead wires extend outwardly from the bead bundle, the mold may be damaged during closing causing shut down and costly repairs. With this method the unvulcanized bead bundle may be changed in shape by handling before placing in the apex mold. Also the bead bundle may be distorted and come apart during the injection process when rubber is being injected past the bead at high velocity and with great force.

In U.S. Patent No. 5,262,115, an apex bead assembly mold for injection molding the apex assembly is shown where the rubber coated bead bundles are held in place on a cylindrical core by spaced-apart coaxial round rings arranged in side by side relation and engaging the axially extending inner surfaces and the radially extending inner surfaces of the beads so that when half molds are mounted around the core with the beads held in place, apex portions may be injection molded. Thereafter, the mold halves are removed and the bead apex assemblies pulled off the rings. During the injection process the unprotected bead bundle of unvulcanized rubber may be distorted or come apart due to high velocity movement of the rubber past of the bead.

## Disclosure of the Invention

This invention relates to a mold for heating and enclosing a circular member comprising a first mold member, a second mold member movable into engagement with the first mold member to provide a mold cavity characterized by the first mold member having a plurality circumferentially spaced first fingers, the second mold member having a plurality of circumferentially spaced second fingers movable into meshing engagement with the first fingers

upon closing of the mold by movement of the first mold member towards the second mold member providing a circular mold cavity for the circular member.

This invention further relates to a bead curing finger mold characterized by a plurality of circumferentially spaced lower fingers disposed in a lower ring, a plurality of circumferentially spaced upper fingers disposed in an upper ring, the lower ring being positioned in a generally horizontal position for supporting a bead bundle, and the upper ring being positioned over the lower ring with the lower fingers interposed between the upper fingers in a closed position of the mold for containing and guiding the bead bundle and providing spaces along the lower fingers and the upper fingers to accommodate variations in size of the bead bundle.

This invention is also directed to the construction of a tire bead comprising multiple revolutions of metal wires coated with rubber and wound in a circular configuration to form a bead bundle characterized by the bead bundle being cured in a bead curing finger mold having a plurality of circumferentially spaced lower fingers disposed in a lower ring in a generally horizontal lower position for supporting the bead bundle, a plurality of circumferentially spaced upper fingers disposed in a generally horizontal upper ring positioned over the lower ring with the lower fingers interposed between the upper fingers in the closed position of the mold for containing and guiding the wires of the bead bundle and providing spaces along the lower fingers and the upper fingers to accommodate variations in size of the bead bundle during vulcanization of the bead upon application of heat to bead curing finger mold.

**Brief Description of Drawings**

Fig. 1 is a front view in perspective of a finger mold embodying the invention shown mounted in a press.

Fig. 2 is an elevation with parts broken away of the upper and lower mold halves shown in Fig. 1 removed from the press with the bead ring shown lifted from the lower mold.

Fig. 3 is a cross sectional view of the molds taken along the plane of line 3-3 in Fig. 2.

Fig. 4 is a plan view of the lower mold half taken along the plane of line 4-4 in Fig. 2.

Fig. 5 is an enlarged fragmentary sectional view of the spring for removing the bead from the upper mold half.

Fig. 6 is an enlarged fragmentary schematic sectional view of the upper and lower finger mold halves shown in Fig. 2 with the bead bundle held by the fingers without bottoming of the finger mold halves.

Fig. 7 is a view like Fig. 6 showing the bead ring after molding and before removal from the lower finger mold half.

**Detailed Description of the Invention**

Referring to Fig. 1, a bead curing finger mold 10 embodying the invention is mounted in a hydraulic press 12 and has an upper finger mold half 14 and a lower finger mold half 16 movable together and apart upon opening and closing of the press. In the embodiment shown, the press 12 provides a pressure of 7 tons (7.11 metric tons) plus or minus 5 tons (5.08 metric tons) and the diameter of the bead is 22.50 inches (57.15 cm), however, with this press, medium radial truck tire beads of diameters having a range of 17.50 inches (44.45cm) to 24.5 inches (62.23 cm) may be molded with finger molds of this type.

Referring to Figs. 1-4, the lower finger mold half 16 is mounted on a bottom press plate 18 and includes a plurality of circumferentially spaced apart lower fingers 20. Vertically movable ejector and bead holders 22 are mounted in the bottom press plate 18 at circumferentially spaced positions around the lower finger mold half 16 for holding a bead bundle 23 prior to closing the press 12 and ejecting the vulcanized bead after the curing cycle.

Referring to Figs. 2, 3 and 5, the upper finger mold half 14 has a plurality of circumferentially spaced upper fingers 24 mounted on a top press plate 26 of the press 12. Four spaced apart upper ejector fingers 27 are individually slidably supported and are spring loaded on the upper finger mold half 14 and have four posts 28 slidably mounted in collars 30, fastened to the upper finger mold half 14. Coil springs 32 are disposed between the collars 30 and the upper ejector fingers 27 to urge the ejector fingers downward into engagement with the bead bundle 23 to eject the bead bundle and separate the bead bundle from the upper mold half 14 as the mold 10 opens. In operation, the press 12 is opened to the position shown in Fig. 1 with the ejector and bead holders 22 in a position above the lower finger mold half 16. The bead bundle 23 is then placed over the lower fingers 20 on the bead holders 22. The bead bundle 23 comprises a ring of bead wires wound and coated with rubber in a bead ring in a manner well-known in the art. The bottom press plate 18 is then raised vertically lifting the bead bundle 23 off the ejector and bead holders 22. As shown in Fig. 7, tapered side surfaces 38 of the lower fingers 20 preferably have the same slope as a bead surface 40 relative to the axial direction A-A, which in this embodiment is an angle X of 15 degrees. However, in other embodiments, this angle may range from 0 to 45 degrees. The angle X is normally the same angle as the angle of the surface of the rim of the wheel on which the tire having this bead bundle 23 is mounted.

The press 12 is closed with the bottom mold plate 18 raised into a seating position with the top press plate 26. The lower finger mold half 16 is raised into position so that the lower fingers 20 are in meshing engagement with the upper fingers 24 as shown in Fig. 6. Steam or other heat transmitting material may then be provided in the press for vulcanizing the bead bundle 23 into a compact bead.

As shown in Figs. 6 and 7, during the closing operation the movement of the lower finger mold half 14 upward towards the upper finger mold half 14 is stopped by the compression of the bead bundle 23. There is no bottoming out of the upper finger mold half 14 against the lower finger mold half 16. This is advantageous because it provides a compact bead ring even though there may be variations in the size of the bead bundle 23. Variations may be accommodated in spaces 40 at the edges of the upper fingers 24 and lower fingers 20.

After vulcanization, the press 12 is opened and the springs 32 urge the ejector fingers 27 downward ejecting the bead bundle 23 as the press 12 opens. The ejector and bead holders 22 protrude through the lower finger mold half 16 and lift the vulcanized bead bundle 23 to the position shown in Figs. 2 and 3 as the bottom mold plate 18 is lowered.

While a certain representative embodiment and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit or scope of the invention.

Having thus described the invention it is now claimed:

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CLAIMS

1. A mold (10) for heating and enclosing a circular member (23) comprising an annular upper finger mold half (14), an annular a lower finger mold half (16) movable into engagement with said annular upper finger mold half (14) to provide a mold cavity characterized by said annular upper finger mold half (14) having a plurality circumferentially spaced upper fingers (24), said lower finger mold half (16) having a plurality of circumferentially spaced lower fingers (20) movable into meshing engagement with said upper fingers (24) upon closing of said mold (10) by movement of said annual lower finger mold half (16) towards said annular upper finger mold half (16) providing a circular mold cavity for said circular member (23).

2. A mold according to claim 1 further characterized by said upper fingers (24) and said lower fingers (20) having sloped edges for guiding and compressing said circular member (23) in a central position upon closing of said mold (10).

3. A mold (10) according to claim 2 further characterized by said upper fingers (24) and said lower fingers (20) having molding surfaces providing a circumferentially continuous molding member surface of said mold (10) with a precise predetermined diameter of said circular member (10) upon closing of said mold (10).

4. A mold (10) according to claim 3 wherein said circular member (23) is a tire bead having a plurality of wires wrapped in a bead bundle (23) and coated with a resilient rubber-like material further characterized by means for heating said mold (10) for vulcanizing said resilient rubber-like material.

5. A mold (10) according to claim 3 further characterized by said upper fingers (24) and said lower fingers (20) having extensions (22) extending beyond said molding surfaces for guiding said circular member (23) and providing recesses for receiving said extensions in the closed condition of said mold (10).

6. A bead curing finger mold (10) characterized by a plurality of circumferentially spaced lower fingers (20) disposed in an annular lower finger mold half (16), a plurality of circumferentially spaced upper fingers (24) disposed in an annular upper finger mold half (14), said annular lower finger mold half (16) being positioned in a generally horizontal position for supporting a bead bundle (23), and said annular upper finger mold half (14) being positioned over said annular lower finger mold half (16) with said lower fingers (20) being interposed between said upper fingers (24) in a closed position of said mold (10) for containing and

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guiding said bead bundle (23) and providing spaces along said lower fingers (20) and said upper fingers (24) to accommodate variations in size of said bead bundle (23).

7. A bead curing finger mold (10) according to claim 6 further characterized by said annular lower finger mold half (16) being raised to close said mold (10) and said annular upper finger mold half (14) having spaced apart spring loaded ejector fingers (27) for retracting upon closing of said mold (10) and for extension upon opening of said mold (10) to transfer said bead bundle (23) to said annular lower finger mold half (16).

8. A bead curing finger mold (10) according to claim 6 further characterized by said annular lower finger mold half (16) having circumferentially spaced apart ejectors (27) and bead holders (22) extending upwardly through said lower annular finger mold half (16) for holding said bead bundle (23) in the lower position of said annular lower finger mold half (16) prior to closing of said mold (10) and ejecting said bead bundle (23) upon lowering of said annular upper finger mold half (14) after vulcanization of said bead bundle (23).

9. A tire bead (23) comprising multiple revolutions of metal wires coated with rubber and wound in a circular configuration to form a bead bundle (23) characterized by said bead bundle (23) being cured in a bead curing finger mold (10) having a plurality of circumferentially spaced lower fingers (20) disposed in an annular lower finger mold half (16) in a generally horizontal lower position for supporting said bead bundle (23), a plurality of circumferentially spaced upper fingers (24) disposed in a generally horizontal annular upper finger mold half (14) positioned over said annular lower finger mold half (16) with said lower fingers (20) interposed between said upper fingers (24) in the closed position of said mold (10) for straightening said wires of said bead bundle (23) and providing spaces along said lower fingers and said upper fingers (20) to accommodate variations in size of said bead bundle (23) during vulcanization of said bead upon application of heat to said bead curing finger mold (10).

10. The tire bead (23) of claim 9 further characterized by said lower fingers (20) and said upper fingers (24) having tapered bead bundle engaging surfaces (38) in converging relationship upon closing movement of said annular upper finger mold half (14) and said annular lower finger mold half (16) for compressing said metal wires during closing of said bead curing finger mold (10).

11. The tire bead bundle (23), according to claim 10 further characterized by said lower fingers (20) and said upper fingers (24) having radially extending surfaces for overlapping said

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bead (23) during closing of said finger mold (10) to limit the closing movement of said lower finger mold half (16) relative to said upper finger mold half (14) and determine the closing movement of the bead curing finger mold (10).

12. A tire bead (23) according to claim 10 wherein the angle of taper of said lower fingers (20) and said upper fingers (24) is from 0 to 45 degrees from a vertical axis of said annular lower finger mold half (16).

13. A tire bead (23) according to claim 12 further characterized by said angle of taper being 15 degrees.

WO 01/03912



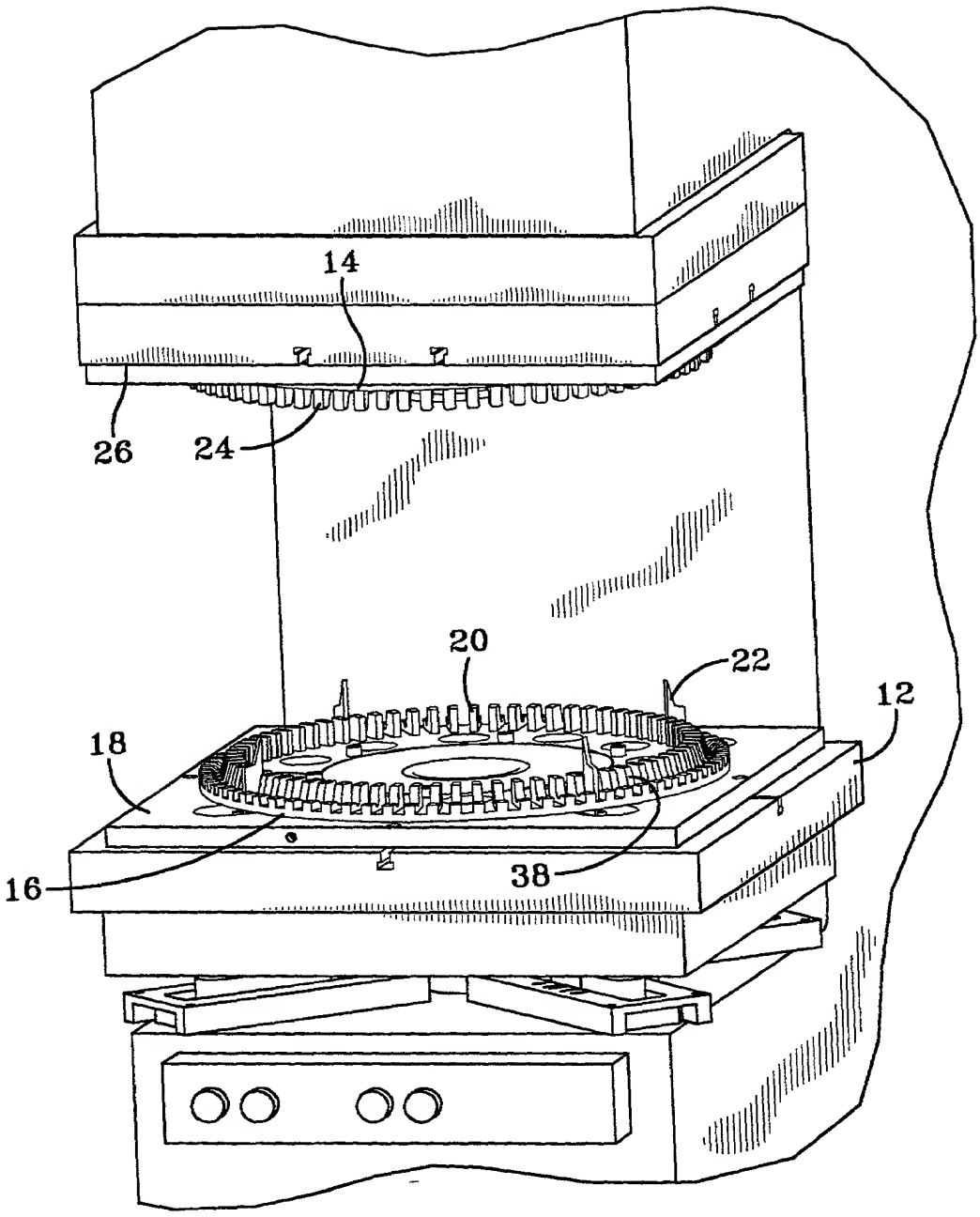


FIG-1

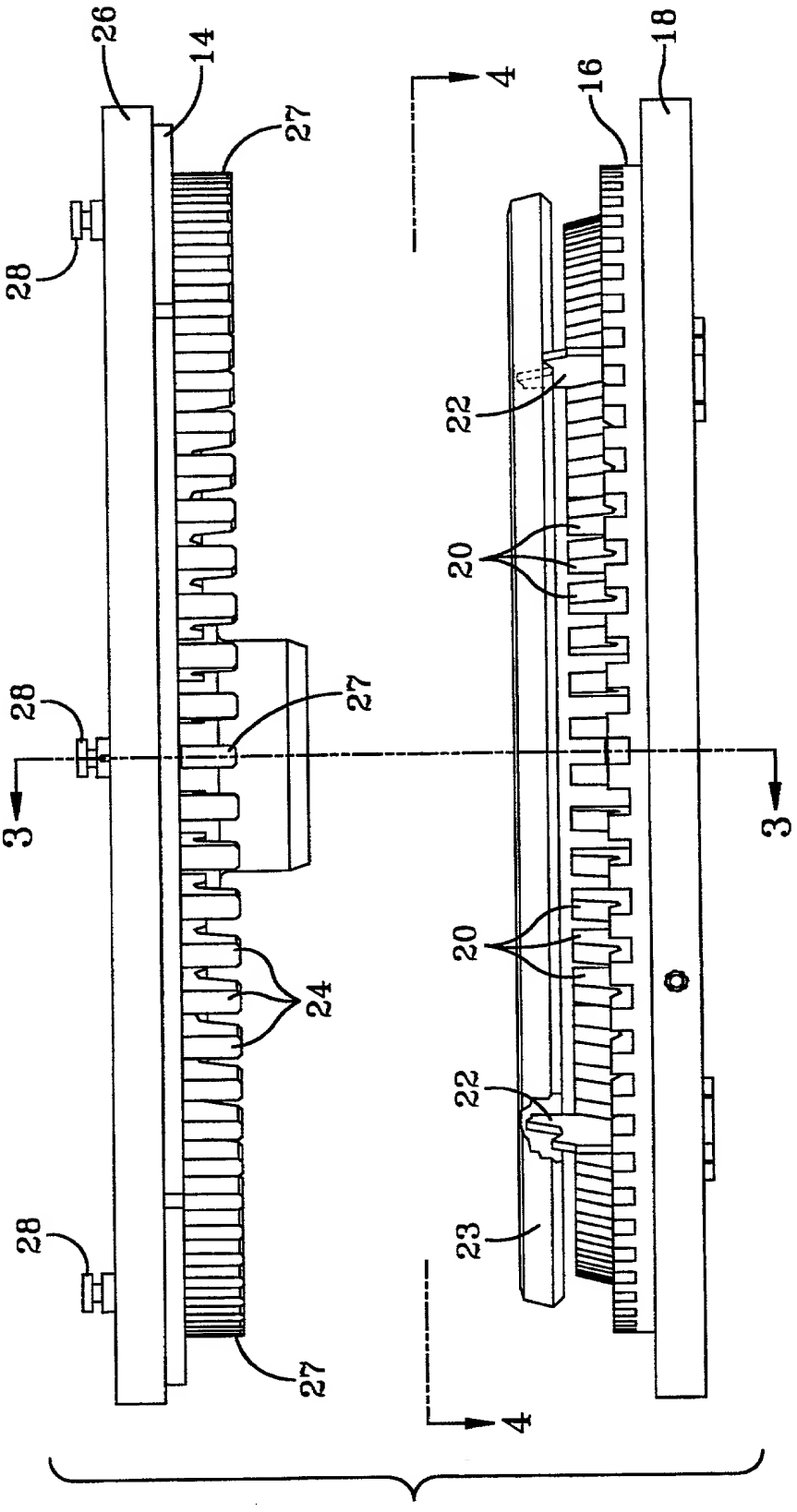


FIG-2

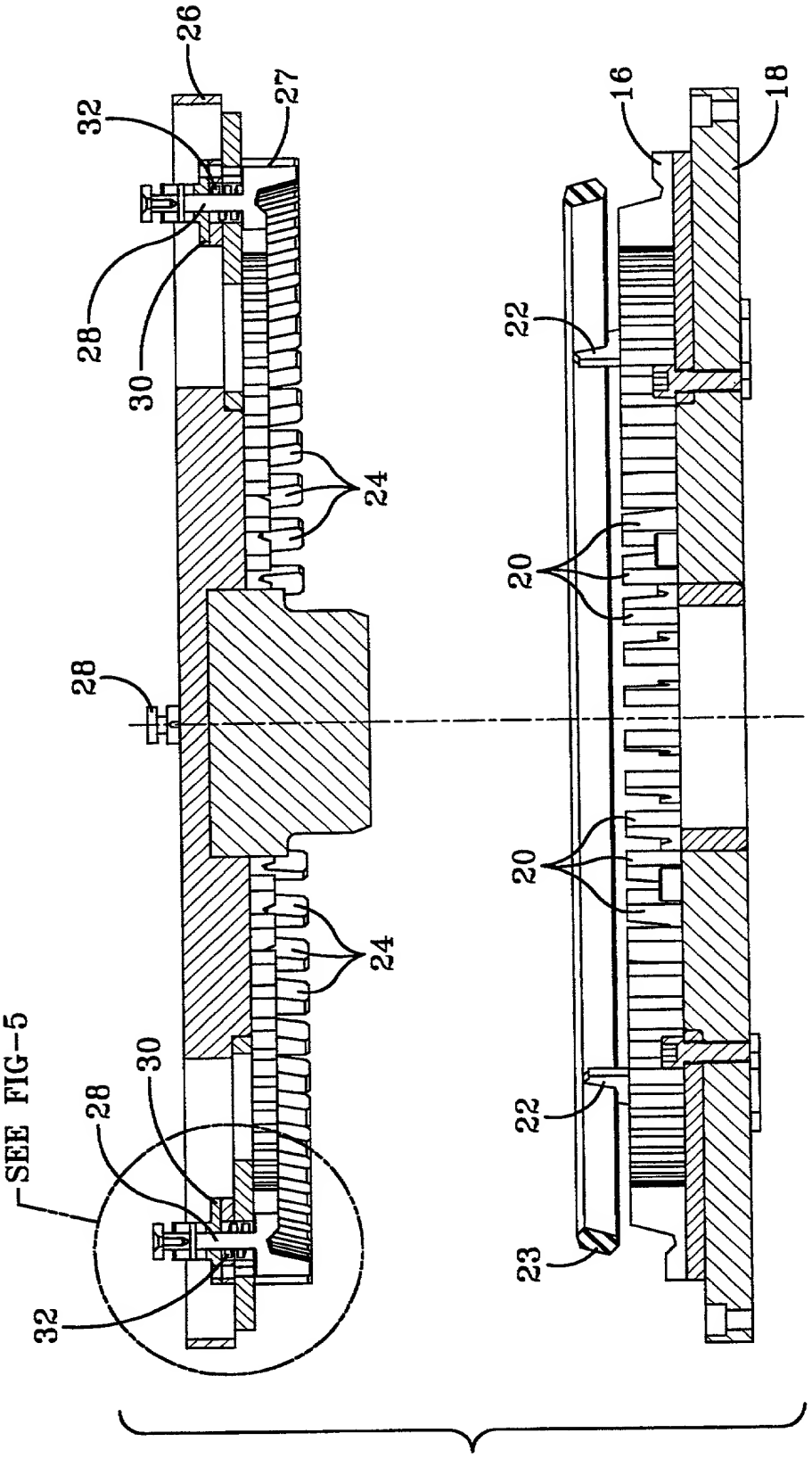


FIG-3

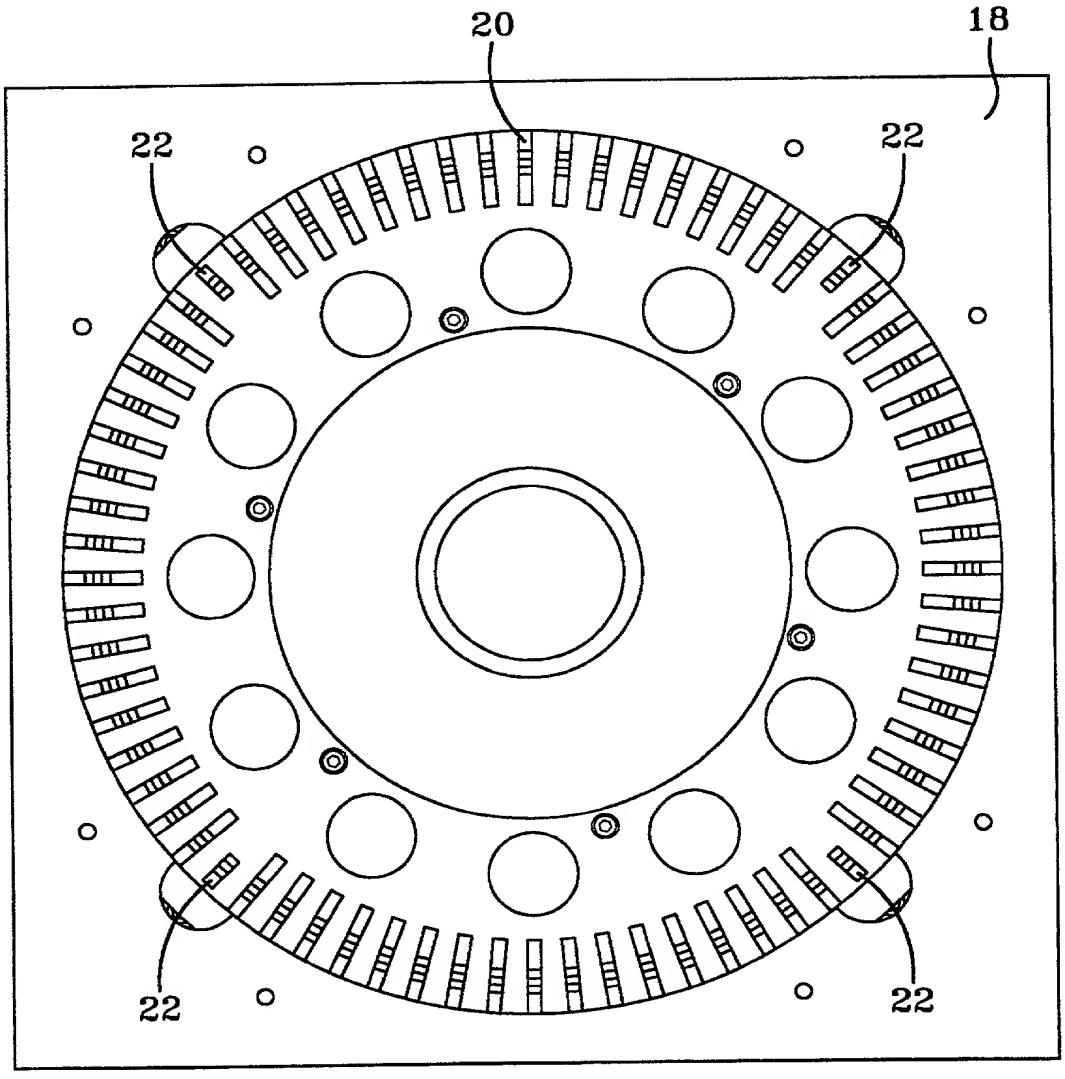


FIG-4

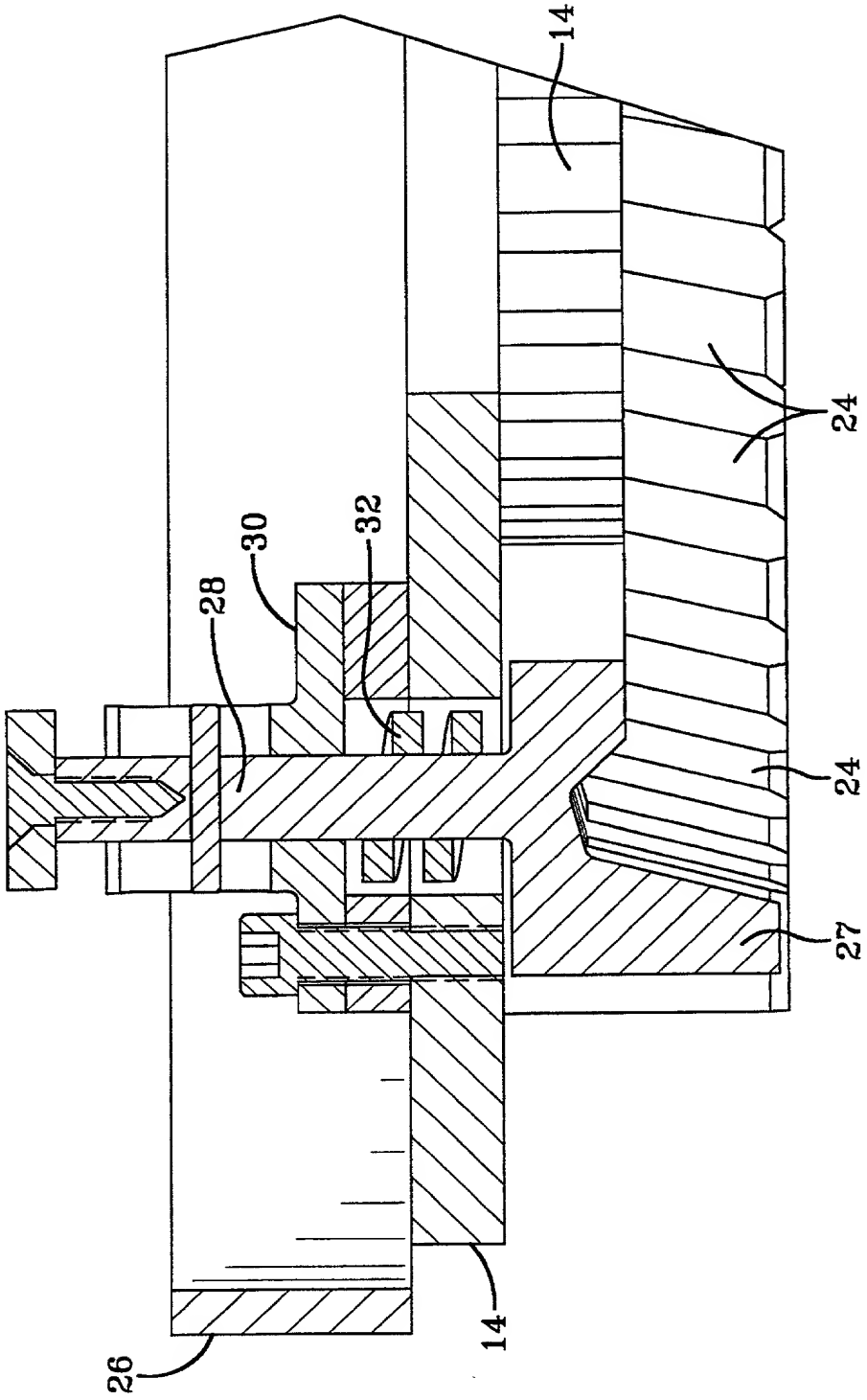


FIG-5

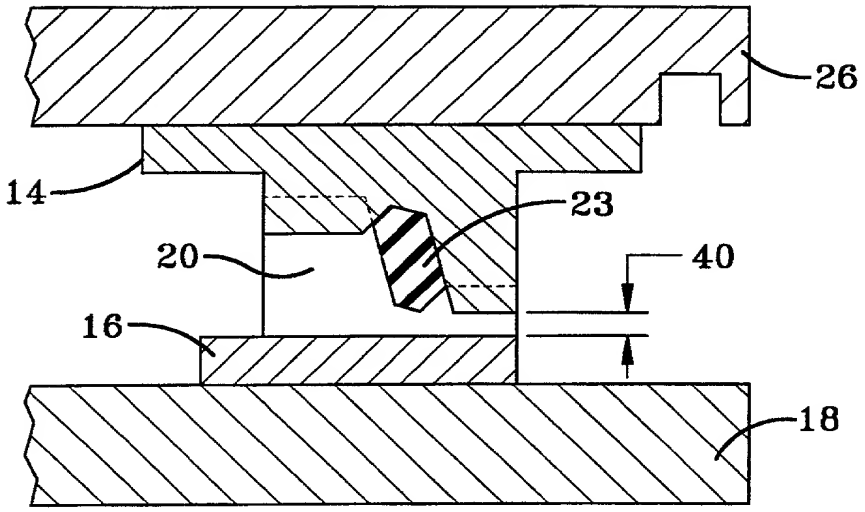


FIG-6

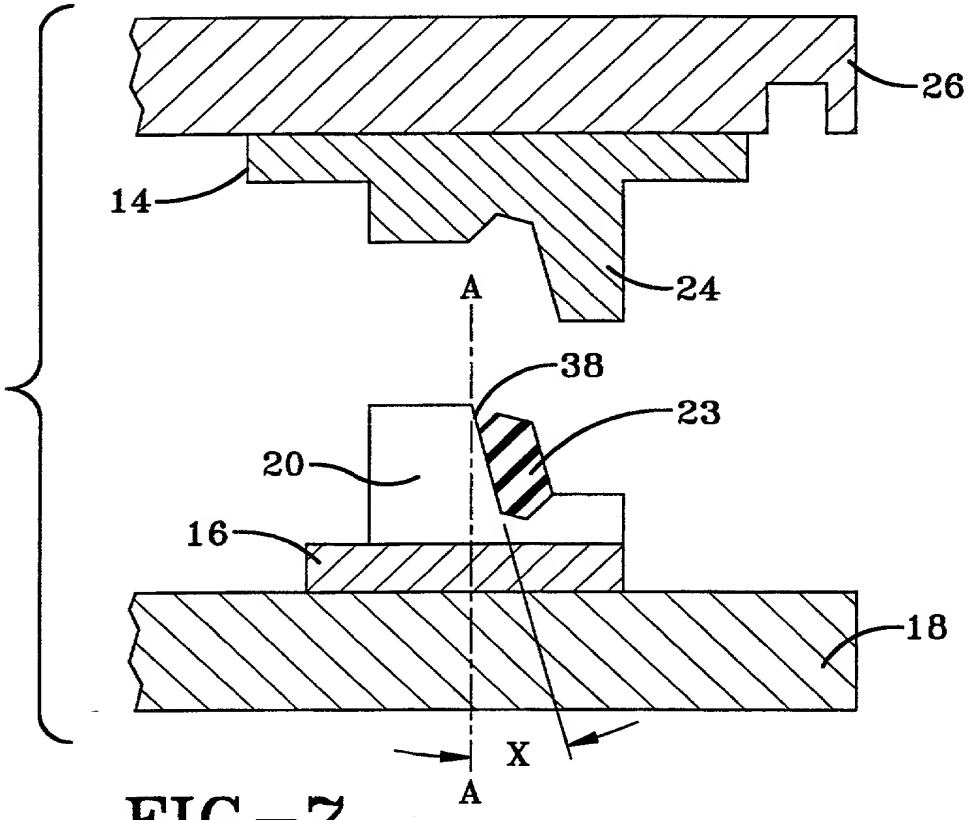


FIG-7

Docket No. DN1999131

## DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled BEAD CURING FINGER MOLD the specification of which (check one)

___X___ is attached hereto.

_____ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below:

_____ (Application Serial No.) _____ (Filing Date)

_____ (Application Serial No.) _____ (Filing Date)

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s) or §365 of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose material information as defined in 37 C.F.R. §1.56 which become between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (Application Serial No.) _____ (Filing Date) _____ (Status)(patented, pending, abandoned)

_____ (Application Serial No.) _____ (Filing Date) _____ (Status)(patented, pending, abandoned)

## POWER OF ATTORNEY

As named inventor(s), I or we hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

| | | |
|---|---|---|
| Frederick K Lacher | Registration No. | 16,502 |
| Robert W Brown | Registration No. | 24,499 |
| Marc R Dion | Registration No. | 31,347 |
| Roger D Emerson | Registration No. | 33,169 |

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statement may jeopardize the validity of the application or any patent issuing thereon.

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Inventor's signature William Allen Rex Date July 12, 1999
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Inventor's signature Brian Joseph Wilson Date July 12, 1999
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Full name of fourth joint inventor, if any (given name, family name) _____
Inventor's signature _____ Date _____
Residence _____ Citizenship _____
Post Office Address _____

☐ Additional inventors are being named on separately numbered sheets attached hereto.

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